

**BSA Item Guide
2017-2108
Math Grade 3**

Legend-

MC - Multiple Choice

MS - Multiselect (student must select all correct answers to receive credit)

EE/NR - Equation Editor/Numerical Response

Red - Student group scored less than 40% correct

MAFS.3.OA.1.1 Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
2	Identify context which would result in given number	MS	44%	Students were asked how 40 objects could be arranged and students selected incorrect scenarios. For example, 35 rows with 5 in each row.
28	Identify scenario matching given equation	MC	56%	Chose division scenario instead of multiplication
51	Identify ways to make a specific product from given pairs of factors	MS	32%	Chose incorrect factor pairs

MAFS.3.OA.1.2 Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
1	Identify a graphic illustrating a word problem	MC	68%	When asked to divide 18 objects into 6 groups, students grouped objects into 3 groups of 6
23	Identify a graphic illustrating a word problem	MC	76%	When given an situation that divides objects into 4 groups, students selected the graphic grouping objects into 2 groups
45	Identify a scenario matching a given expression	MS	20%	Chose a multiplication scenario instead of division

MAFS.3.OA.1.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
4	Use multiplication to solve word problems in situations involving equal groups	MC	68%	Used division
24	Given a word problem involving equal groups identify the equation with a symbol for the unknown number	MC	54%	Selected a division equation instead of a multiplication equation
46	Use multiplication and division to solve word problems in situations involving equal groups	EE/NR	35%	Only solved first step of a two-step word problem

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MAFS.3.OA.1.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
6	Determine unknown whole number in a division equation relating three whole numbers	EE/NR	82%	Students divided incorrectly
26	Determine unknown whole number in a multiplication equation relating three whole numbers	MC	77%	Students selected the incorrect factor
48	Determine unknown whole number in a division equation relating three whole numbers	EE/NR	73%	Students selected the incorrect factor

MAFS.3.OA.2.5 Apply properties of operations as strategies to multiply and divide.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
3	Apply commutative property as a strategy to multiply	EE/NR	81%	When given $3 \times 7 = 7 \times \underline{\quad}$, student selected 21
25	Apply the commutative and associative property as a strategy to multiply	MS	47%	Could not identify equivalent expressions using the associative or commutative properties
47	Apply distributive property as strategy to multiply	MC	30%	Students did not understand the distributive property

MAFS.3.OA.2.6 Understand division as an unknown-factor problem.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
5	Identify multiplication as a way to solve division	MC	81%	Given $24 \div n = 8$ students selected $8 \times 24 = n$ as way to solve
30	Identify multiplication as a way to solve division	MS	52%	Did not understand the relationship between multiplication and division
50	Identify multiplication as a way to solve division	MC	76%	Given $48 \div 6 = \underline{\quad}$ student selected $6 \div \underline{\quad} = 48$

MAFS.3.OA.3.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
8	Fluently multiply within 100	MC	59%	Incorrect answer
31	Fluently multiply and divide within 100	MS	24%	Incorrect multiplication and division
49	Fluently divide within 100	MC	69%	Incorrect answer

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MAFS.3.OA.4.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
12	Solve a two-step word problem using the four operations	MC	62%	Only completed the first step
27	Identify the correct equation to be used to solve a two-step word problem using the four operations	MC	55%	Student chose equation that added given numbers instead of multiplying as required by word problem
52	Solve a two-step word problem using the four operations	EE/NR	36%	Only completed one of the two steps

MAFS.3.OA.4.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
10	Identify arithmetic patterns in an addition table	MC	45%	Selected the statement "The sum of any two numbers is even" when examining patterns in an addition table
29	Identify a pattern in a multiplication situation	MC	62%	Students believed that when counting by an odd number, such as 5, the numbers counted will all be odd
63	Identify a pattern in a multiplication table	MC	21%	Students did not correctly identify the row in a multiplication table when given digits in the ones place

MAFS.3.NBT.1.1 Use place value understanding to round whole numbers to the nearest 10 or 100.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
13	Use place value understanding to round whole numbers to the nearest 100	EE/NR	63%	Students rounded 347 to 400 instead of 300
33	Use place value understanding to round whole numbers to the nearest 10	EE/NR	59%	Rounded 268 to 300 instead of 270
62	Use place value understanding to round whole numbers to the nearest 10 and 100	MC	40%	Incorrect rounding to the nearest 10 (like #33)

MAFS.3.NBT.1.2 Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
11	Fluently subtract within 1,000	EE/NR	85%	Incorrect answer
32	Fluently add and subtract within 1,000	MS	27%	Incorrect answer
53	Fluently add within 1,000 using 3 numbers	MC	77%	Regrouping error

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MAFS.3.NBT.1.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80 , 5×60) using strategies based on place value and properties of operations.

Item	Item Description	Item Type	Percent Correct	Most Common Error
9	Multiply one-digit whole numbers by multiples of 10 in the range 10–90	MS	36%	Incorrect order of operations
35	Multiply one-digit whole numbers by multiples of 10 in the range 10–90	EE/NR	40%	When asked to find the ‘product’ the student added the given numbers
54	Multiply one-digit whole numbers by multiples of 10 in the range 10–90 and add products	MC	58%	Did not add multiples of given numbers, just the given numbers

MAFS.3.NF.1.1 Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.

Also Assesses:

MAFS.3.G.1.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

Item	Item Description	Item Type	Percent Correct	Most Common Error
14	Identify the fraction model of a given fraction	MC	71%	When asked to find model representing $3/5$ the student selected the incorrect model.
39	Identify the fraction model of a given fraction	MC	81%	When asked to identify a model representing $3/4$ student selected only model with 3 segments shaded, when all models had 8 segments
56	Given a fraction model, identify the whole	MC	20%	Given a model of $1/8$ student was unable to find the model of the whole

MAFS.3.NF.1.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.

MAFS.3.NF.1.2a Represent a fraction $1/b$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $1/b$ and that the endpoint of the part based at 0 locates the number $1/b$ on the number line.

MAFS.3.NF.1.2b Represent a fraction a/b on a number line diagram by marking off a lengths $1/b$ from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.

Item	Item Description	Item Type	Percent Correct	Most Common Error
16	Identify $3/4$ on a number line diagram by marking off $1/4$ lengths from 0	MC	52%	Identified $1/4$ on the number line
40	Identify a fraction on a number line diagram	MC	47%	Counted 4 units but counted the 0 on the number line as 1
58	Identify a mixed number on a number line diagram	MC	24%	Incorrect answer-confused $1/3$ on the number line with $1/4$

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MAFS.3.NF.1.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

MAFS.3.NF.1.3a Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

MAFS.3.NF.1.3b Recognize and generate simple equivalent fractions, e.g., $\frac{1}{2} = \frac{2}{4}$. $\frac{4}{6} = \frac{2}{3}$. Explain why the fractions are equivalent, e.g., by using a visual fraction model.

MAFS.3.NF.1.3c Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

MAFS.3.NF.1.3d Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.

Item	Item Description	Item Type	Percent Correct	Most Common Error
15	Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers	MC	5%	Could not identify a model divided into parts as a whole number
34	Compare two fractions with same numerator or denominator by reasoning about their size	MC	56%	Example—"One pizza is divided into halves, one into thirds and one into fourths. Which pizza had the fewest pieces?" Students chose answer with the most pieces.
57	Recognize simple equivalent fractions	MS	10%	Identified $\frac{1}{4}$ as equivalent to $\frac{4}{1}$

MAFS.3.MD.1.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

Item	Item Description	Item Type	Percent Correct	Most Common Error
18	Tell time to the nearest minute	MC	70%	Confused minute hand with hour hand (Analog clock showing 5:05 was read as 5:01)
41	Solve word problems involving addition and subtraction of time intervals in minutes	MC	53%	Answered with time given in the item and did not complete the word problem
60	Solve word problems involving addition and subtraction of time intervals in minutes	MC	59%	Added incorrectly within context of word problem

MAFS.3.MD.1.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.

Item	Item Description	Item Type	Percent Correct	Most Common Error
21	Measure masses of objects kilograms (kg) and subtract to solve one-step word problems	MC	45%	Students subtracted instead of adding as required by the real-world situation.
43	Measure liquid volumes using liters (l) and add to solve one-step word problems	EE/NR	65%	Subtracted instead of adding
59	Measure liquid volumes using liters (l) and add to solve one-step word problems involving volumes	EE/NR	21%	Could not determine measurement of unlabeled increments on a beaker

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MAFS.3.MD.2.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

Item	Item Description	Item Type	Percent Correct	Most Common Error
22	Solve a one-step “how many more” problem using information presented in a scaled bar graph	EE/NR	40%	Did not account for scaled graph
37	Identify a scaled bar graph that represents a data set	MC	83%	Students selected the incorrect graph
66	Identify a scaled picture graph to represent a data set	MC	50%	Did not use key that showed each picture represented 2

MAFS.3.MD.2.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

Item	Item Description	Item Type	Percent Correct	Most Common Error
17	Generate measurement data by measuring lengths using rulers marked with fourths of an inch	MC	31%	Students could not correctly use a ruler to measure an object to the nearest $\frac{1}{4}$ inch.
38	Generate measurement data by measuring lengths using rulers marked with fourths of an inch. Show the data by making a line plot	MC	40%	Did not select correct line plot or did not measure items correctly
65	Show measurement data by identifying correct line plot	MC	54%	Only graphed fractional part of mixed number lengths-If object measured $1\frac{1}{2}$ the student graphed $\frac{1}{2}$

MAFS.3.MD.3.7 Relate area to the operations of multiplication and addition.

MAFS.3.MD.3.7a Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

MAFS.3.MD.3.7b Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.

MAFS.3.MD.3.7c Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.

MAFS.3.MD.3.7d Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Also Assesses

MAFS.3.MD.3.5 Recognize area as an attribute of plane figures and understand concepts of area measurement.

MAFS.3.MD.3.5a A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area.

MAFS.3.MD.3.5b A plane figure, which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.

Also Assesses:

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MAFS.3.MD.3.6 Measure areas by counting unit squares (square cm, square m, square in, square ft., and improvised units).				
Item	Item Description	Item Type	Percent Correct	Most Common Error
19	Recognize area as an attribute of a plane figure and understand concept of area measurement	MC	33%	Did not understand concept of area
42	Measure area by counting unit squares	MC	75%	Students added two sides, or all four sides to find area
61	Find area of figure by decomposing it into non-overlapping rectangles; add areas of non-overlapping parts; apply technique to solve real-world problem	EE/NR	32%	Added given dimensions in diagram

MAFS.3.MD.4.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
20	Identify perimeter in a real-world scenario	MC	32%	Did not understand the concept of perimeter
44	Solve real world problem involving perimeter given all side lengths	EE/NR	46%	Found area
64	Identify rectangles with same area but different perimeters	MC	31%	Found rectangle with the same area and perimeter

MAFS.3.G.1.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.				
Item	Item Description	Item Type	Percent Correct	Most Common Error
7	Find shared attributes of two shapes	MC	56%	Students did not identify common attribute (right angle)
36	Find shared attributes that define a larger category (given three shapes)	MC	69%	Did not select an attribute to describe all 3 shapes
55	Find shared attributes that define a larger category (given four shapes)	MS	12%	Did not select an attribute to describe all 4 shapes